Agri. Res. .1. Kerala, 1973, 11 (1) 57—60

SEASONAL **VARIATIONS IN SOIL REACTION AND SOLUBLE SALT** CONTENT OF *KUTTANAD* **RICE SOILS, KERALA STATE**

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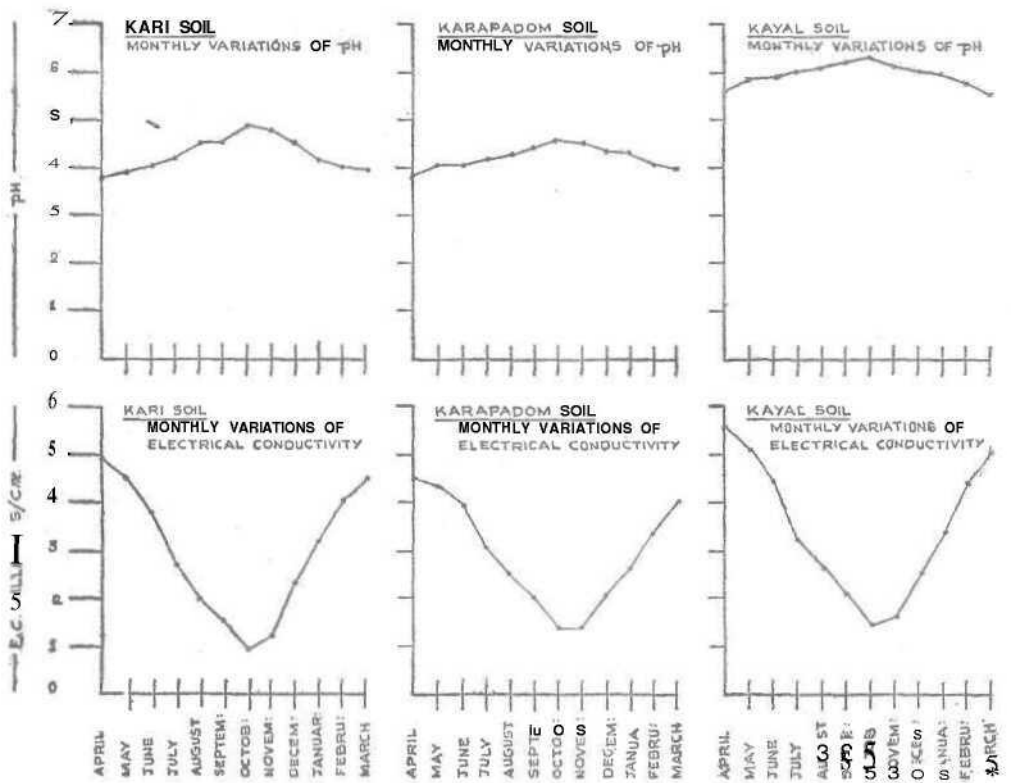
Kari, Karapadom and *Kayal* fields constitute the vast rice growing region of *Kuttanad*, in Kerala State. This area comprising nearly 75,000 hectares is situated at or below sea level in the Districts of Alleppey and Kottayam and is submerged for the major part of the year. Besides, they are periodically inundated by saline water due to tidal inflow from the Vembanad lake. After de-watering the fields, a single crop is grown during the five month period from October–February in most of the area. *Kayal* soils with very low content of organic matter is slightly acid to neutral in reaction. *Kari* (Peat) and *Karapadom* (river borne alluvium) soils are highly acid in reaction and are noted for their high content of partially decomposed wood fossils (Balakrishna-Kurup, 1965 , Frequent saline water inundation and water logging may positively influence the soil reaction and soluble salt content of these rice soils. A high soluble salt content is known to affect germination of rice and growth at early stages. Such a soil condition at later stages, especially after flowering and during the grain filling period adversely affects the final yield (Pearson and Bernstein 1959). The success of rice culture in *Kuttanad*, therefore, depends on avoiding high salinity at the earlier and later stages of crop growth. Further, at present, photo-insensitive varieties with a medium duration of 100 to 130 days are grown in the region during the period from October to February. Attempts are being made to raise two crops in the region where only one is raised at present with suitable short duration varieties of rice. In this context the present study on the seasonal variation in soil reaction and soluble salt content of the rice soils of *Kuttanad* will enable us to find out the most suitable cropping period with favourably low concentration of soluble salts and tolerable pH conditions for the soils, during which a medium duration or two short duration crops can be successfully raised.

Materials and methods

Soil samples were collected at monthly intervals from ten marked locations each in the *Kari, Karapadom* and *Kayal* areas of kuttanad and their pH and soluble salt content were determined. This study was conducted for three years from 1965 to 1968. Soil pH was determined in



1:2.5 soil-water suspension using photovolt pH meter provided with glass electrodes. Soluble salt content was determined in 1:2 soil-water extracts using solu-bridge, U.S. Salinity Laboratory type and results were expressed in milli mhos/cm.

Results and discussion

Figure 1 presents the monthly variation in pH and soluble salt content (in milli mhos/cm) of the three soil types viz. *Kari*, *Karapadom* and *Kayal*. Maximum and minimum pH values were recorded in all the three soil types when sampled during the periods from October to November and March to April respectively. The electrical conductivity of 1:2 extracts of the soils was a maximum during the period from March to April and a minimum during October to November. Seasonal fluctuations in soil pH were most marked in *Karl* soils, moderate in *Karapadom* soils and least in *Kayal* soils while variations of soluble salt content were more pronounced in *Kayal* soils than in kari and *Karapadom* soils.

The decrease in pH observed during the summer months (February to April) may be due to the sulphuric acid liberated by the oxidation and hydrolysis of iron sulphides present in the soils (Vander Speak, 1950). Ponnamperuma *et al.* (1966) attributed the pH changes on flooding acid sulphate soils *to* changes in the oxidation-reduction potential (Eh), organic matter status and amount of active iron and manganese. The soils in the present study are known to be rich in organic matter and active iron (Pisharody and Brito-mutunayagom 1965) and are water logged for the greater part of the year. Hence the possible influence of such factors on the pH cannot be excluded. However, this **ia** an aspect for detailed investigation which is currently engaging the attention of workers in this laboratory.

The maximum electrical conductivity is observed during the summer months (March to April) in all the three types of soils. This is due to the increase in salinity of the lake waters during the summer and also due to the capillary rise of soluble salts from the sub-soils. The greater proximity of the *Kayal* soils to the open lake from where saline water intrudes into the fields account for the greater salinity encountered in such soils during summer. The general trend of the monthly variation in soluble salt content in all the three types of *Kuttanad* soils clearly indicates that in the present crop season (October to February) during the early stages of growth the rice plants encounter moderate amounts of soluble salts but their concentration progressively increases to toxic levels at flowering and maturing stages. This adversely affects the final yield. If the cultivation period is shifted from October-February months to August-December months the undesirable effects of salinity on rice growth especially at the flowering stage can be avoided. A barrage is now under construction at Thanneermukkom for the prevention of saline water ingress from the Vembanad lake into the rice growing tract of *Kuttanad.* This project when completed would prevent saline water intrusion But it may bring up another problem viz , aluminium toxicity in acid *Kari* and *Karapadom* soils. Frequent inundation and consequent leaching of the exchangeable aluminium by saline water prevents the changes of development of aluminium toxicity in these soils. Another engineering pro. ject undertaken for *Kuttanad* rica area is the construction of permanent bunds for the rice fields. These engineering projects when viewed with the results obtained from the present study show that by shifting the crop season to August-December from the present season of October-February and using short duration varieties that are being developed, it is possible to raise two crops instead of one as is practised at present.

Summary

Soil samples collected at monthly intervals from ten marked locations in the *Kari* (Peat), *Karapadom* (river borne allaviun) and *Kayal*

(reclaimed lake bed) soils of *Kuttanad* were examined for their pH and electrical conductivity for 3 consecutive years from 1965 All the three soil types register the maximum and minimum values for soil pH and the minimum and maximum values of electrical conductivity when sampled during the periods of October-November and March-April ively. The study revealed the possibility of shifting the cultivation season from the present October-February period to August-January. This will result in a remarkable increase in rice yield by eliminating the hazards of salinity during flowering and grain filling periods and improve the chances of taking a double crop from the area.

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(M. S. received 17-6-1973)